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THE EFFECTS OF CONSEQUENCE MANIPULATION DURING FUNCTIONAL ANALYSIS OF PROBLEM BEHAVIOR MAINTAINED BY NEGATIVE REINFORCEMENT

KATHRYN POTOCZAK

SHIPPENSBURG UNIVERSITY

AND

JAMES E. CARR AND JACK MICHAEL

WESTERN MICHIGAN UNIVERSITY

Two distinct analytic methods have been used to identify the function of problem behavior. The antecedent-behavior-consequence (ABC) method (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) includes the delivery of consequences for problem behavior. The AB method (Carr & Durand, 1985) does not include consequence delivery, instead relying exclusively on antecedent conditions to evoke the behavior. The AB and ABC functional analysis methods were compared in this study with 4 children with developmental disabilities who engaged in task-related problem behavior. Results show that the ABC method identified an escape method for all four cases, whereas the AB method failed to identify a function for any case.

DESCRIPTORS: functional analysis, assessment, problem behavior

In a comprehensive review of the functional analysis literature, Hanley, Iwata, and McCord (2003) described two distinct methods of functional analysis. The ABC (antecedent-behavior-consequence) method, developed by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), operates by arranging putative establishing operations (EOs), reinforcers, and discriminative stimuli during test conditions in an effort to simulate the maintaining contingency. Differentially high responding (compared to a control condition) is attributed to a reinforcement process. The AB method, first reported by Carr and Durand (1985), operates by arranging putative EOs and discriminative stimuli during test conditions (e.g., Meyer, 1999). Unlike the ABC method, the AB method does not program consequences for problem behavior; thus, reinforcement processes can only be inferred from any elevated responding that occurs.

Given that both analysis methods are designed to determine the function of problem behavior and are in current use (Hanley et al., 2003), research directly comparing the two methods appears to be warranted. In an examination of the ability of various functional analysis test conditions to generate sufficient levels of problem behavior, Worsdell, Iwata, Conners, Kahng, and Thompson (2000) found that including both the putative EO and reinforcer were necessary for test conditions to generate high levels of attention-maintained problem behavior. Test conditions including only the putative EO, as in the AB method, generated insufficiently low levels of problem behavior. The purpose of the present study was to extend this finding by comparing relative capacity of the AB (Carr & Durand, 1985) and ABC (Iwata et al., 1982/1994) functional

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Address correspondence to Kathryn Potoczak, Department of Psychology, Shippensburg University, 1871 Old Main Drive, Shippensburg, Pennsylvania 17257 (e-mail: kmpoto@ship.edu).

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analysis methods to identify the function of escape-maintained problem behavior.

METHOD

Participants and Setting

Four students who exhibited problem behavior during academics that did not appear to serve an automatic reinforcement function (this behavior was excluded because the AB method does not typically include a test condition for automatic reinforcement) during a direct-observation assessment were recruited for the present study. Ursula, Darryl, and Larry had educational eligibility classifications of educable mental impairment. Ursula was a 9-year-old girl with Down syndrome. Darryl was a 7-year-old boy with autism. Larry was an 8-year-old boy with no additional psychiatric diagnosis. Howie was a 17-year-old boy with an educational eligibility classification of trainable mental impairment and a diagnosis of attention deficit hyperactivity disorder.[1]

The experiment took place in one of three meeting rooms in the participants' school, depending on their availability. Each of the rooms contained a table, chairs, session materials, and a video camera to record sessions. The experimenter conducted three 10-min sessions with each student on a daily basis.

Dependent Variables and Data Collection

Task-related problem behavior was the primary dependent variable and was scored using a 10-s partial-interval recording system. Ursula's problem behavior included refusal to reply or participate, denoted by closing her eyes or laying her head down on the table. Howie's problem behavior consisted of grabbing or tearing test materials (flash cards), refusal to participate by engaging in squealing or laughing, and out-of-seat behavior. Darryl's problem behavior consisted of grabbing or tearing test materials and out-of-seat behavior. Larry's problem behavior was his refusal to reply by turning in his seat or saying, ''no!'' as well as out-of-seat behavior.

Procedure

Task assessment. Each student's teacher was interviewed to identify difficult tasks for subsequent analysis conditions. To corroborate these reports, the experimenter presented participants with each nominated task. Easy tasks were defined as those students performed with 100% accuracy, whereas difficult tasks were those students performed at or below chance level. Receptive identification of animals and letters (e.g., ''point to the horse'') was chosen as the easy task for all students. These tasks were presented during the Easy 100 condition of the AB method. Receptive identification of simple addition problems (e.g., ''point to the one that equals 7'') was chosen as the difficult task for all students. This task was presented during the Difficult 100 condition of the AB functional analysis and during the demand condition of the ABC functional analysis.

Experimental design. A test–control multielement design was used to demonstrate experimental control within each functional analysis method (Iwata, Duncan, Zarcone, Lerman, & Shore, 1994). An AB design, counterbalanced across participants, was used to compare the AB and ABC functional analysis methods. The AB method was conducted first for Ursula, Howie, and Darryl. The order of assessment was reversed for Larry to detect any sequence effects. An equal number of sessions was conducted for each method, and different-colored tablecloths were used in each condition to assist with discrimination (Conners et al., 2000).

ABC method. The ABC method was based on procedures described by Iwata et al. (1982/1994) and included demand and control conditions. During the demand condition, the

[1]These educational eligibility classifications have been changed. ''Mild cognitive impairment'' and ''moderate cognitive impairment'' have replaced the classifications ''educable mental impairment'' and ''trainable mental impairment,'' respectively.

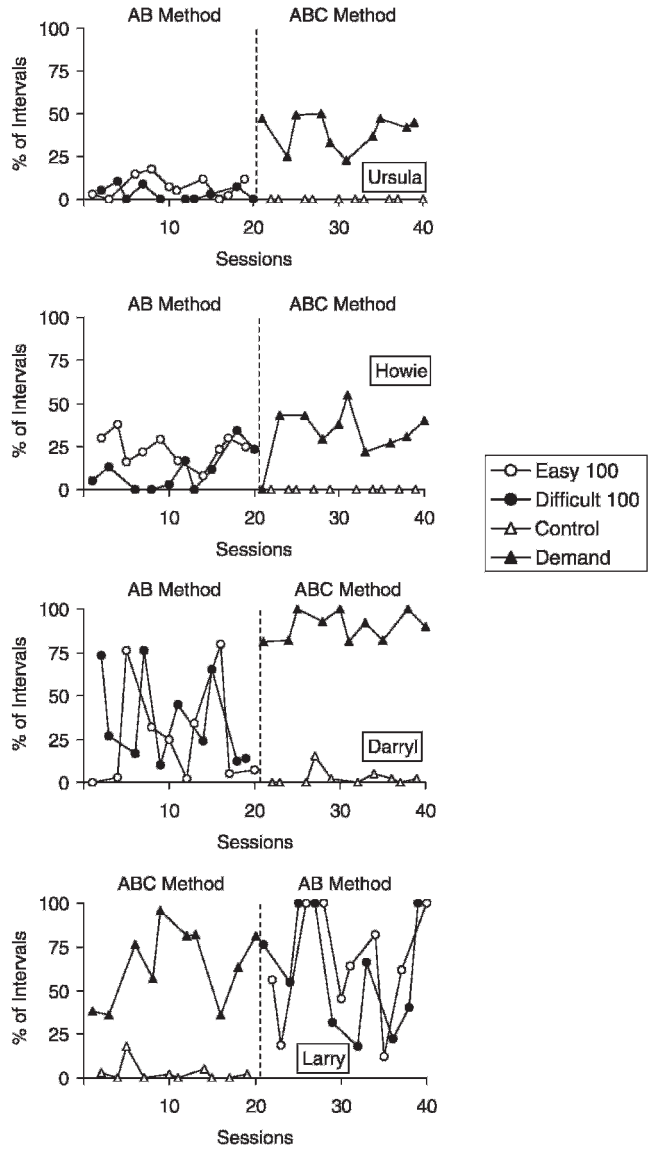

Figure 1. Percentage of intervals of problem behavior during each functional analysis method for each participant.

experimenter presented difficult tasks every 10 s using a least-to-most prompting hierarchy. Independent and prompted correct responses were praised. Instruction was terminated for 30 s contingent on problem behavior, after which the participant was returned to his or her seat, if necessary, or in Ursula's case, verbally prompted to sit up. During the control condition, the participant engaged in a highly preferred activity (as determined by a prior preference assessment), playing the card game "Memory" with the experimenter. Noncontingent attention was delivered on a fixed-time 30-s schedule, and no demands were presented. All problem behavior was ignored during this condition.

AB method. The AB method was based on procedures described by Carr and Durand (1985) and included Difficult 100 (test) and Easy 100 (control) conditions. The type of tasks

used and the demands issued were identical to those used during the demand condition of the ABC method. In contrast with demand condition of the ABC method, 30 s of escape was not provided in either condition. Rather, out-of-seat behavior resulted in the student being led back to his or her seat immediately and continued task presentation. The experimenter presented a difficult task and delivered attention during each 10-s recording interval of the Difficult 100 condition. The experimenter presented an easy task and delivered attention during each 10-s recording interval of the Easy 100 condition.

Interobserver Agreement

Interobserver agreement was assessed during at least 24% of sessions and was calculated using a point-by-point agreement formula. Mean occurrence agreement was at least 93% and mean nonoccurrence agreement was at least 92% for each participant.

Procedural Integrity

Data were collected on the experimenter's correct implementation of the test condition in each functional analysis method. Contingent task removal was scored on an interval-by-interval basis as occurring or not occurring in the demand condition of the ABC method. These data were then compared interval by interval to the recorded data on occurrence and nonoccurrence of the target behavior to determine in which intervals task removal was appropriate (an interval in which a target behavior had occurred or the subsequent interval) or inappropriate (an interval in which no target behavior had occurred). Integrity percentages were calculated on an interval-by-interval basis by dividing the number of intervals in which escape was appropriate by the number of intervals in which escape was provided appropriately or inappropriately and multiplying by 100%. Procedural integrity was assessed for at least 25% of sessions and averaged 100%.

No reinforcement contingencies were in effect during experimental conditions of the AB method. Therefore, procedural integrity of the number of demands issued during the Difficult 100 condition (every 10 s, or 100% of intervals) was evaluated instead for at least 25% of sessions. The presentation of tasks was scored on an interval-by-interval basis. Integrity percentages were calculated by counting the number of intervals in which tasks were presented. When these instances were counted and averaged across the conditions that were scored, and then divided by 60, it was found that treatment integrity was 98%.

RESULTS AND DISCUSSION

Each student's functional analysis data are depicted in Figure 1. The ABC method resulted in differentiated response patterns for all 4 participants, with each of them displaying differentially high responding in the demand condition. Thus, a behavioral function was identified for all participants using the ABC method. The AB method resulted in more ambiguous outcomes. Ursula and Howie exhibited low levels of problem behavior across both conditions. In contrast, Darryl and Larry exhibited high and undifferentiated responding in both conditions. Nevertheless, because responding was undifferentiated for all participants in the AB analysis, no determination of behavioral function resulted from these analyses.

The relative success of the ABC method is not surprising in light of the Worsdell et al. (2000) findings (see also Fischer, Iwata, & Worsdell, 1997). However, it is unclear why the AB method failed to identify behavioral function as it has in other studies (e.g., Carr & Durand, 1985; Durand & Carr, 1992; Meyer, 1999). Given that the AB method may rely on generating responding via extinction bursts or intermittent reinforcement of more severe forms of behavior (Hanley

et al., 2003), it is perhaps not surprising that the AB method might not be effective in some cases. It is also possible that our outcomes were influenced by restricting our sample to response topographies that were most likely reinforced by escape from demands. In the AB method, demands were present in both the Difficult 100 and Easy 100 conditions. In the ABC method, demands were present only in the demand condition. Given that Darryl and Larry exhibited the highest responding of the 4 participants, it may be that any demand placed on the participant, regardless of difficulty, functioned as an EO for problem behavior. It might also be that some other aspect of the instructional context, regardless of the curriculum, might have served as the EO (see Smith, Iwata, Goh, & Shore, 1995). Conversely, Ursula and Howie exhibited lower rates of problem behavior than did Darryl and Larry. One plausible explanation for these results is that the noncontingent attention present in both conditions of the AB method may have competed with the functional reinforcer (escape) and decreased the problem behavior of these participants (Fischer, Iwata, & Mazaleski, 1997).

The findings of the present study could have been strengthened by including a reversal in which functional analysis outcomes were replicated within participants. However, the clarity of the effect and its presence regardless of condition order appear to mitigate this concern. Certain AB assessments appear to have merit. For instance, designing behavioral assessments in which consequences are held constant and only antecedents to problem behavior are manipulated has been repeatedly shown to be worthwhile for identifying specific antecedent variables that influence problem behavior (e.g., O'Reilly 1995, 1999; Smith et al., 1995). By contrast, given the extensive literature refining the ABC method, the conceptual support it enjoys, and the existing empirical evidence (from the present study and Worsdell et al., 2000), the ABC method is recommended when attempting to determine the reinforcers for (or adaptive function of) problem behavior.

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